SYSTEM AND METHOD OF GENERATING

INSTRUCTIONAL INFORMATION FROM GRAPHIC

IMAGES AND FONTS FOR USE IN PRODUCING A CRAFT PROJECT

RELATED APPLICATIONS

[0001]   This application claims the benefit of the filing date of co-pending U.S. Provisional Application, Serial No. 60/319,819, filed December 28, 2002, titled "Process for Creating Instructional Needle Craft Patterns for the Completion of Needlepoint Projects," the entirety of which provisional application is incorporated by reference herein.

FIELD OF THE INVENTION

[0002]   The invention relates generally to computerized processes for generating instructional information to be used in the production of craft projects. More specifically, the invention relates to computerized processes for converting computerized images into this instructional information.

BACKGROUND

[0003]   Needlecraft workers interested in designing their own needlecraft projects in time past used graph paper to provide a grid of squares within which to represent the desired project. Each square on the graph paper represented a position in the pattern and became associated with a color. The needlecraft worker also needed to consider the dimensions of the finished needlecraft project, the thread colors, corresponding manufacturer thread

numbers, the type of cloth for sewing, and the number of stitches per inch of the cloth. The needlecraft worker also associated a different symbol with each color represented in an image and inscribed one of the symbols in each position in the grid. The process was manually intensive, time consuming, and unable to provide the needlecraft worker with an accurate view of the finished pattern used for the completion of the project.

[0004] Computers and software now automate the task of needlecraft pattern generation. Various commercially available software programs produce needlecraft patterns from computerized images. Nonetheless, such software programs typically limit the number of images from which a pattern can be produced to one. These software programs also tend to limit the number of colors used to 200 or less per pattern. This limitation can affect the final result of the sewn project. The typical needlecraft worker, however, can rarely find a single image that contains all of the desired subject matter and in the desired arrangement. More commonly, needlecraft workers find desirable subject matter in multiple images and prefer to produce the desired needlecraft pattern from a combination of these images.

[0005] To use multiple images, however, the needlecraft worker often needs an additional program, such as an image editor, to produce the single image that can then be converted into a needlecraft pattern using the conventional software described above. The image editing programs are an added expense, complicate the process, and make the process more time consuming. These

drawbacks, consequently, discourage the use of such programs, especially by non-professional needlecraft workers who are primarily unsophisticated hobbyists with little or no inclination to use such sophisticated image-editing software. Thus there remains a need for a system and method of generating a needlecraft pattern from multiple graphic images that avoid the drawbacks of the aforementioned solutions.

SUMMARY

[0006]   In one aspect, the invention features a method for producing a craft project. A graphical workspace is displayed on a display screen. A plurality of images is placed in the graphical workspace for inclusion in the craft project. A composite image is produced from the plurality of images in the workspace, and the composite image is converted into instructional information used to produce the craft project.

[0007]   In another aspect, the invention features a method for producing a craft project. A Web page is transmitted to a client system. The Web page produces a graphical workspace on a display screen of the client system and enables a user of the client system to produce a composite image from a plurality of images. The composite image is received from the client system over a network and converted into instructional information for use in generating the craft project.

[0008]   In yet another aspect, the invention features a network comprising a client system connected to a server system. The client system executes

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browser software for accessing a Web page hosted by the server system. The Web page produces a graphical workspace on a screen display at the client system when downloaded from the server system. The Web page enables a user of the client system to generate a composite image from a plurality of images placed into the graphical workspace by the user. The client system transmits the composite image to the server system for conversion into instructional information for producing the craft project.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]   The above and further advantages of this invention may be better understood by referring to the following description in conjunction with the accompanying drawings, in which like numerals indicate like structural elements and features in various figures. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention.

[00010] FIG. 1 is a block diagram of an embodiment of a computer environment in which to practice the invention, the computer environment having a client system in communication with a server system over a network.

[00011] FIG. 2 is a flow diagram of an embodiment of a process for producing instructional information for a craft project in accordance with the principles of the invention.

[00012] FIG. 3 is a diagram of an embodiment of instructional information including a grid representation of a needlecraft pattern produced in accordance with the principles of the invention.

[00013] FIG. 4 is an example of instructional information used to assist a needlecraft worker in the manual or machine-operated sewing of the needlecraft project onto a piece of material.

[00014] FIG. 5 is a flow diagram of an embodiment of a process of making images and fonts available for use in producing instructional information for use in craft projects for a price in accordance with the principles of the invention.

DETAILED DESCRIPTION

[00015] FIG. 1 shows an embodiment of a computing environment 2 in which customized instructional information for use in craft projects is produced in accordance with the principles of the invention. Craft workers use instructional information in a variety of craft projects, such as bead-working, embroidery, cross-stitching, crewel, and needlepoint. In general, the instructional information serves as guidance or instructions for manual or automatic production of the craft project on a piece of material (e.g., cloth, bead strings). In some embodiments, the instructional information is printed or displayed and used by a craft worker as a template or design that is to be produced on a piece of material. In other embodiments, the instructional information is stored in a file format that is downloaded or installed on a

programmable sewing or embroidery machine. The instructional information thus programs the machine to produce a likeness of a craft project on the piece of material. Whether printed, displayed, or stored in a file format, the instructional information determines the positions for each colored thread to be sewn onto the material or for each colored bead to be placed on a string.

[00016] The computing environment 2 includes a first computing system 10 (hereafter, client) in communication with a second computing system 14 (hereafter, server) over a communications network 18. Although the client 10 and server 14 are shown to be external to the network 18, it is to be understood that either or both the client 10 and the server 14 can be included in the network 18. The network 18 can be a large international network (e.g., the Internet or the World Wide Web) or a small local area network (LAN). The client and server 10, 14 can connect to the network 18 through a variety of connections including standard telephone lines, LAN or WAN links (e.g., T1, T3, 56 kb, X.25), broadband connections (ISDN, Frame Relay, ATM), and wireless connections. Connections are established using one or more of a variety of communication protocols (e.g., HTTP, TCP/IP, Ethernet, and direct asynchronous connections). Other client and server systems (not shown) can also be connected to the network 18 without departing from the principles of the invention.

[00017] In general, the client 10 is a processor-based device (e.g., a personal computer, Macintosh computer, workstation, personal digital assistant, and

network terminal) with a graphically driven user interface, a display screen 22,

a keyboard 26, an input or pointing device (e.g., a mouse, trackball, touch-pad,

touch-screen, etc) 30, and persistent storage (not shown) for storing data and

software programs. One software program stored in the persistent storage is

browser software, e.g., but not limited to, NETSCAPE NAVIGATOR™ and

MICROSOFT INTERNET EXPLORER™. The operating system of the client 10

can be one of a variety of platforms including but not limited to WINDOWS 3.x,

WINDOWS 95, WINDOWS 98, WINDOWS NT 3.51, WINDOWS NT 4.0,

Macintosh, UNIX, Linux, and WINDOWS CE for windows-based terminals. The

client 10 can also include a modem (not shown) for communicating with an

Internet service provider (ISP) on the network 18.

[00018] The server 14 is, in general, a conventional computing device that

maintains one or more Web sites and includes memory for storing text files,

graphics files, and executable scripts (e.g., applets) collectively stored and

accessed as Web pages. An example file format for implementing Web pages is

the Hypertext Markup Language or HTML. The server 14 also includes

communications capabilities for receiving requests from the client 10 to access

a stored Web page and for transmitting information related to the accessed

Web page to the client 10 in reply. The server 14 can support a variety of

operating system platforms, such as, for example, WINDOWS 3.x, WINDOWS

95, WINDOWS 98, WINDOWS NT 3.51, WINDOWS NT 4.0, WINDOWS CE for

windows-based terminals, Macintosh, Java, and Unix. An ISP or business

association can maintain and operate the server 14.

[00019] In brief overview, the invention features an automated method for generating instructional information (for producing a craft project) from multiple digital images. As used herein, images include fonts, text, symbols, and other types of special characters, such as Greek alphabets. Generation of the instructional information can occur entirely on the client 10, entirely on the server 14, or in part on the client 10 and in part on the server 14. For embodiments in which the generation of instructional information involves the server 14, in whole or in part, the server 14 maintains a Web site having one or more Web pages that facilitate the design of the craft project. Available for use in the generation of the instructional information, a variety of computerized images reside on the server 14, stored in private and public databases. A private database is accessible by that client user only to whom that database is assigned; a public database is accessible to each client user who accesses the Web site of the invention.

[00020] FIG. 2 shows an embodiment of a process 100 for designing a custom craft project. Reference is made to the computing environment 2 of FIG. 1. In brief overview, a craft worker operating the client 10 executes (step 104) software that produces a graphical workspace on the display screen 22. The workspace includes an area of pixels (e.g., an array of pixels) within which the craft project is designed. Initially, the color of all pixels in the workspace is white. The size of the workspace accommodates a portion of or the entire craft project. In one embodiment, executing the software includes launching the browser software to access Web pages over the network 18 from the server 14

using the Universal Resource Locator (URL) of the needlecraft Web site hosted by the server 14.

[00021] In one embodiment, the craft worker logs in to a user-specific "area" of the server 14. To log in, the client 10 exchanges information (e.g., username and password) with the server 14 to authenticate (step 108) the craft worker. When the user is authenticated, the server 14 sends (step 112) a Web page to the client 10 that includes at least one applet used to produce instructional information for customized craft projects.

[00022] In step 116, the browser executing on the client 10 translates text files and any accompanying graphics files and applets of the downloaded Web page, and displays the results on the screen 22. Execution of one applet produces the graphical workspace within a browser window displayed on the screen 22. In one embodiment, the applet is written in JAVA™.

[00023] The executing software requests (step 120) project design information from the craft worker provides. For a needlecraft project, examples of project design information include the type of material or cloth, the color of thread or floss currently possessed by the craft worker and desired to be used in the needlecraft project, and the manufacturer or supplier number (or other identifier) associated with such thread. The type of material determines the number of stitches per inch. Various types of materials and methods of sewing can be used without departing from the principles of the invention. The software sets a size limitation for the needlecraft project by requiring the user

to provide dimensions or to select preset dimensions. The dimensions can be defined in terms of counts (i.e., stitches per inch.) In another embodiment, the dimensions are freeform, that is, the software sets no limits to the size of the needlecraft project. The software determines the dimensions of the needlecraft project from the images placed in the workspace by the craft worker.

[00024] The craft worker then previews and selects (step 124) a plurality of graphic images for inclusion in the craft project. File formats for images that can be used in the present invention include, but are not limited to, Graphics Interchange Format (.gif)), Joint Photographic Experts Group (.jpg), Tag Image File Format (.tif), and bitmap (.bmp). Images for use can reside in various locales: at the client 10 (e.g., on the hard drive or on a CD); at the server 14 (e.g., in his or her private database, in the public database, in a retailer-provided database); at another server with which the server 14 can communicate to obtain images; or at any combination of the client 10 and servers. The databases from which to select images can appear in the same window as the workspace or, if not in the same window, in a concurrently visible window as the window with the workspace.

[00025] The craft worker can preview an image without selecting it. To select a particular image, the craft worker highlights the image (by using a preview function or by hyper-linking its filename) and can use a variety of ways to select the image such as clicking a "Select" graphical button using the input device 30, pressing a "hot key" on the keyboard 26, "double-clicking" on the

filename of the image, or "dragging and dropping" the selected image into the

workspace. These operations generally result in storing the selected image into

memory of the client 14. When a selected image resides at the server 14 (or at

a server accessible to the server 14), the server 14 sends (step 128) the image

to the client 14 over the network 18. Once the craft worker has obtained the

selected images from the server 14 the client 10 does not need to remain

connected to the server 14 to produce the composite image. In one

embodiment, the "session" of the craft worker on the server 14 terminates.

[00026] One or more of the selecting operations can also result in

automatically placing (i.e., displaying) the selected image in the workspace. In

step 132, the craft worker places two or more of the selected images into the

workspace. Any number of images can be placed into the workspace. When

an image is placed into the workspace, a layer number (e.g., a z-depth value)

becomes associated with the image. Each image is associated with a link,

which, when activated, allows the user to select and independently move that

image up or down in the layers of images without affecting the other images.

In one embodiment, the image being placed into the workspace is automatically

assigned the top layer, and the layer values assigned to the other images in the

workspace are incremented (i.e., become lower layers). To move a top-layered

image to a lower-level layer, the Web site has a directional button that allows

the craft worker to move the top image down through the layers of images to

the desired position.

[00027] Each image placed into the workspace covers a plurality of workspace pixels, and thus each workspace pixel becomes associated with the pixel value of the topmost image covering that pixel. Images that are too large for the workspace (i.e., the pixel dimensions exceed the pixel dimensions of the workspace) can be cropped or scaled to fit. Many, if not all, images have "white space" around or outside the subject matter of the image. The white space can obscure pixels of images at lower levels. The present invention causes the white space to be, in effect, transparent, so that the pixel colors of lower level images below that white space become part of the composite image; that is, this surrounding white space does not become part of the composite image.

[00028] Once an image is in the workspace, the craft worker can manipulate (step 136) the image in a variety of ways, e.g., resize, flip, and place in back, place in front to produce a desired arrangement. The image can also be removed from the workspace. The layered arrangement of images in the workspace represents a composite image to be used to produce the instructional information for producing the customized craft project.

[00029] Once the layered arrangement satisfies the craft worker, the craft worker produces (step 140) a composite image by merging all of the selected images placed in the workspace. This operation can occur by activating, for example, a graphical button displayed on the screen 22. The composite image can be stored locally on the client 10 or sent (step 144) to the server 14 (i.e.,

uploaded) for storage in a private or public database. The Web page displayed at the client 10 includes a graphical button for initiating "save" operations.

[00030] To produce a craft project from the composite image (stored locally at the client 10 or stored previously (in step 144) at the server 14), the craft worker activates (step 148) another graphical button. The composite image passes (step 148) to the server 14 (if not already there). If, at the time of transferring the composite image, the previous session between the client 10 and server 14 has terminated, the server 14 authenticates the client 10, as described above in connection with step 108, to initiate a new session.

[00031] The server 14 then performs (step 152) a conversion process that transforms the composite image into instructional information that aids the craft worker in producing the craft project on a piece of material (e.g., cloth, bead string).

[00032] FIG. 3 shows an embodiment of instructional information useful in the production of a needlecraft project. The instructional information includes a grid representation 200 of a needlecraft pattern having an array of grid elements 204. Each grid element 204 is mapped to one of the pixels in the composite image. One or more grid elements 204 can be mapped to the same composite image pixel. Each grid element 204 is assigned the color of the composite image pixel to which that grid element is mapped. The particular arrangement of assigned colors in the grid representation 200 produces a

likeness of the composite image. The conversion process maps each assigned color to the nearest thread color (e.g., for a given thread manufacturer).

[00033] In one embodiment, the grid representation 200 includes machine-readable instructions that direct processor-based means (e.g., a programmable sewing machine, a programmable embroidery machine) to produce the needlecraft pattern on a piece of material. In one embodiment, the instructional information includes printed or displayed symbols in the each of the grid elements 204. Each symbol is associated with a particular color. The location of symbols in the array of grid elements indicates where each color is to be sewn. It is to be understood that other embodiments of the conversion process can produce representations of needlecraft patterns that have formats different than that of a grid.

[00034] The instructional information is transferred into a file format that the craft worker can store in a personal database on the client 10 for immediate printing. This file can also be transferred to and displayed on other types of electronic devices, such as personal digital assistants (PDAs) and hand-held PCs. For embodiments in which the instructional information includes machine-readable instructions, the file can be installed on a processor-based (i.e., programmable) sewing or embroidery machine. The machine is thus configured to produce the corresponding craft project on a piece of material.

[00035] In an alternative embodiment of the process, the executing software is a program installed or running at the client 10 that facilitates the generation of

the instructional information without any need for communicating with the server 14. In yet other embodiments, for example, in thin client computing environments, the execution of the process 100 occurs entirely on the server 14 and the graphical results are displayed at the client 10.

[00036] FIG. 4 shows another example of instructional information, in table format, for assisting a needlecraft worker in the sewing of the needlecraft project. Typically, this type of instructional information supplements the grid representation 200 described above. The instructional information provides a cross-reference for each color symbol, the number of strands of thread for that particular color used in the needlecraft project, the type of thread (i.e., manufacturer), the manufacturer number of the thread, and the name of the color.

[00037] The conversion process also determines from the needlecraft-worker-supplied information whether the worker personally owns any of the color threads. If a match is found, the instructional information indicates which colors of thread are used in the needlecraft project that the needlecraft worker already owns. Thus, these colors of thread are not necessary to buy to sew the project. Conversely, the instructional information shows those colors of thread that the needlecraft worker does not currently own, and thus alerts the needlecraft worker as to which color threads to buy. In one embodiment, a manager of the craft Web site provides needlecraft kits to needlecraft workers who produce composite images at the Web site. The manager can use the

instructional information to determine which colors of thread to send needlecraft workers in order to complete their needlecraft project.

[00038] FIG. 5 shows an embodiment of a process 300 of providing images on the server 14 for possible use in the construction of customized craft projects and associated monetary compensation. In step 304, a third-party computer user logs on to the server 14 and gains access to his or her user-specific area of the server 14. The third-party user then performs one or more of the following operations: 1) transmitting (i.e., uploads) one or more images to his or her own personal database; 2) uploading one or more images to the public database; and 3) transferring images from his or her own personal database to the public database. The manager of the server 14 can set time limits for keeping images in the private and public databases.

[00039] When uploading images to the server 14, the third-party user provides information regarding each uploaded image, such as a key word or words describing the image and the dimensions of the image (e.g., 50 pixels by 50 pixels). In one embodiment, the public database includes a plurality of predefined folders into which third-party users can place images. As an example of a hierarchy of folders, consider a "dolls" folder with sub-folders that divide dolls into particular colors or pixel dimensions. In another embodiment, the third-party user uploads a folder of images, the folder containing a plurality of images of a particular class or subject matter (e.g., dolls, animals, and people). Preferably, each image in a particular folder has the same pixel

dimensions, the same subject matter, or both. Also, the third-party user provides the descriptive information once for the folder, when uploading a folder to the server 14, and not for each image in the folder.

[00040] Images placed in the public database are available to other visitors of the Web site who can select and use such images for a fee or for free. Images in the personal database are not shareable with others until the third-party user transfers them to the public database. The third-party user can sell individual or groups of images.

[00041] At step 308, the server 14 assigns an identification number to each image placed in the public database. The identification number directly or indirectly identifies the third-party that provided the image. At step 312, the server 14 assigns a monetary value to the image, the price being set by the third-party who provided the image. Some images in the public database may have no cost associated therewith.

[00042] In like manner described above, a craft worker logs on to (step 316) the needlecraft Web site on the server 14 and searches for images to use in the needlecraft project. The craft worker searches for and selects (step 320) images to use and places the selected images into the workspace. The search can occur using one or more of the following manners: by a keyword search, by searching through a third-party's images, by searching through images in the public database, by posting a message on a message board for exchanging

images with other users of the Web site, and by searching through their own personal image database.

[00043] Selecting images from a third-party is analogous to placing that image in a shopping cart. The craft worker can select images from a plurality of third parties (i.e., have a plurality of shopping carts, one for each third party). If the composite image contains images taken from the public database that were placed in the public database by a third-party and associated with a monetary value, the craft worker pays the monetary value associated with that image. In one embodiment, the craft worker purchases those images downloaded from the server 14 to the client system of the craft worker. In another embodiment, those images remaining in the workspace are purchased at the moment of converting the composite image into the instructional information used to produce the craft project. If the craft worker desires to lease a single image or group of images from a third party, those images are transferred into the personal database of the craft worker. A leasing fee is charged to the craft worker when the transfer is made. The lease can be for a limited time, for limited usage, or for unlimited usage. The server 14 ensures that the terms of the lease are upheld, e.g., by removing the image or group of images from the personal database when the lease expires. The server 14 also ensures that leased images cannot be downloaded from a personal database to the client computer so that the server 14 maintains control of the leased image and can thereby uphold the terms of the lease.

[00044] An online payment service, such as PAYPAL™, can be used to pay each third party for their images that are leased, downloaded, or used in the needlecraft project. Alternatively, the server 14 tracks the purchases, and the manager of the Web site pays each third party on a periodic schedule or when the sales of the third party reach a predefined threshold.

[00045] The craft worker can manipulate each image in a variety of ways, e.g., resize, flip, and place in back, place in front, and remove the image from the workspace. When satisfied with the selection and arrangement of images within the workspace, after the images are merged into a composite image, the craft worker converts (step 324) the composite image in the workspace into instructional information as described above.

[00046] The present invention may be implemented as one or more computer-readable software programs embodied on or in one or more articles of manufacture. The article of manufacture can be, for example, any one or a combination of a floppy disk, a hard disk, a hard-disk drive, a CD, a DVD, a FLASH memory card, an EEPROM, and EPROM, a PROM, a RAM, a ROM, or a magnetic tape. In general, any standard or proprietary, programming or interpretive language can be used to produce the computer-readable software programs. Examples of such languages include C, C++, Pascal, JAVA, BASIC, Visual Basic, and Visual C++. The software programs may be stored on or in one or more articles of manufacture as source code, object code, interpretive code, or executable code.

[00047] While the invention has been shown and described with reference to specific preferred embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the following claims. For example, the principles of the invention apply also to the craft of bead-working. Instead of producing instructional information for generating needlecraft patterns for use in needlecraft projects, the craft Web site described above can be configured to assist a craft worker in developing instructional information for producing braids made of beads. This instructional information provides the appropriate instructions and identifies the needed materials to construct the braids. These instructions and materials can be sent to the craft worker in a kit as described above.

[00048] What is claimed is: